

Policy Analysis of the Virtual Hospital Model: A Case Study of Sydney Local Health District Virtual Hospital

FINAL REPORT

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This research study was conducted within 8 months and was part of Enrico Gallo's PhD research. It was supported by A/Prof. Philip Haywood from the Leeder Centre for Health Policy, Economics and Data and Miranda Shaw, General Manager at Sydney Local Health District Virtual Hospital (Sydney Virtual).

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Acronyms

ABF	Activity Based Funding
CALD	Culturally and Linguistically Diverse
DH&I	Digital Health and Information
ED	Emergency Department
EMR	Electronic Medical Record
FHIR	Fast Healthcare Interoperability Resources
NSW	New South Wales
SDPR	Single Digital Patient Record
VH	Virtual Hospital

Executive Summary

Purpose of Policy Analysis

The aim of this research was to develop a policy analysis of the VH model in collaboration with the Sydney Local Health District Virtual Hospital (Sydney Virtual), in Australia. This research study is part of the doctoral thesis of Enrico Gallo, Visiting PhD Candidate at The University of Sydney from March to December 2025 and PhD Candidate at the University of Milan-Bicocca. The title of his thesis is "New technologies and organisational processes in healthcare: towards a virtual hospital", and its broader aim is to understand the funding mechanisms, benefits and challenges associated with this model, as well as the reliability and security of data protection and business continuity systems and processes.

The main objective of the research was to analyse the implementation and management of virtual care services at Sydney Virtual to create a model that can be applied in other contexts. The study will focus on the management process and the methods used to overcome organisational and technical challenges that arose during the implementation of the services.

Research Question: How did Sydney Virtual overcome the barriers to implementing a virtual hospital? Which organisational and technical procedures can be extracted from the experience of establishing Sydney Virtual to inform a policy framework?

Study Design

This study involved the review of relevant available documentation, qualitative semi-structured interviews and the review of data reports (mixed method). Following Robert K. Yin's established case study methodology [1], researchers analyzed internal documents, conducted qualitative interviews with diverse staff, and examined survey data. The literature review contextualized Sydney Virtual within Australia's healthcare system, while interviews, structured using Kallio et al.'s framework [2], captured perspectives of researchers and health professionals. Thematic analysis, guided by Naeem et al.'s six-step framework [3], ensured a rigorous and insightful interpretation of the findings.

Key Findings

Sydney Virtual, launched in 2020 on the same day that NSW Health activated its COVID-19 Pandemic Plan, has scaled to 18 acute and chronic services, serving ca. 13,600 patients annually at home, clinics, EDs, and across metropolitan, regional and rural areas. It has become a model for virtual healthcare in Australia.

Thematic analysis identified seven interdependent blocks: 1) regulatory framework; 2) funding model; 3) governance structure; 4) support to patients; 5) workforce upskilling and training; 6) IT and data management; 7) research and evaluation.

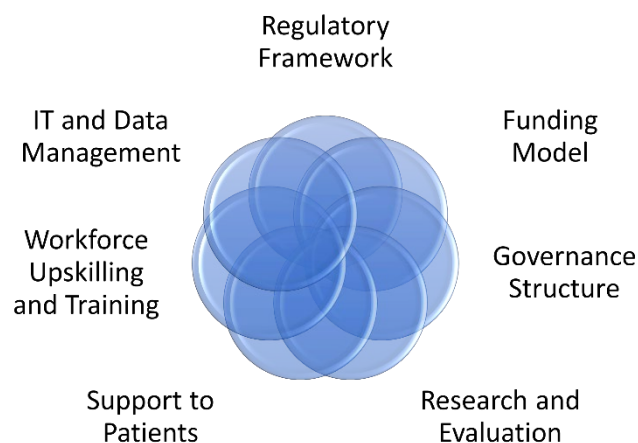
While lacking specific virtual hospital regulations, its adaptability and internal policies have enabled effective operation. Significant block funding for innovation during its early years, combined with a diverse mix of funding sources, supported its growth (especially critical during the COVID-19 pandemic). Sydney Virtual has shared costing and evaluation data with all levels of government as it has evolved, noting that pricing strategies require maturity and robust data collection to be effective.

A standalone governance structure, strong leadership, and supportive management have been pivotal, fostering collaboration with other hospitals and ensuring smooth information flow through internal committees. Trust from patients and the community is central to its success, with initiatives like the Digital Patient Navigator addressing digital illiteracy and the ongoing analysis of patient experience data informing service improvements.

Multidisciplinary co-located teams enhance coordination and problem-solving, while the Digital Lead role bridges communication gaps between ICT and clinicians. The Electronic Medical Record system and a customised remote patient monitoring platform and dashboard have streamlined patient management, improving interoperability through standards like FHIR. Statewide initiatives, such as the Single Digital Patient Record, aim to further unify patient data across providers.

Patient satisfaction, as reflected in over 6,000 PREM surveys, is high: 94% rated care good/very good; 91% benefited from virtual appointments; 85% would reuse virtual care. Top benefits included avoided travel (>70%), better condition management (>60%), and savings, with 10% stating they would forgo care without virtual options. PREM data highlights equity gains, though self-selection bias is noted.

Sydney Virtual thrives on the interconnected, dynamic relationship between its seven core components (governance, funding, technology, workforce, patient support, regulation, and evaluation). These elements continuously interact, with changes in one area influencing others, creating feedback loops that drive adaptation. Success depends on holistic integration, not isolated interventions, ensuring resilience and responsiveness in a rapidly evolving healthcare landscape.



1. Background

Over the past sixty years, public health spending in OECD countries has grown rapidly [4]. The pressure exerted by demographic, social and epidemiological changes on national health systems is putting their sustainability at risk. The reasons for the increase in healthcare spending include the ageing of the population, a trend that will lead to an increase in the population aged over 60 from 1 billion in 2020 to 2.1 billion in 2050 [5], as well as the gradual increase in recent years in the number of people with chronic noncommunicable diseases.

Multi-morbidity exacerbates healthcare spending growth, projected to rise from 6.5% to 10% of GDP by 2070 in many nations due to interacting chronic diseases [4]. Multi-morbidity stresses fiscal sustainability through cost drivers like fragmented care. According to estimates of the World Health Organization, the structural shortage of health professionals is expected to reach 11 million worldwide by 2030 [6].

In response to these issues, virtual hospitals (VH), defined as “centralized hubs” in which multidisciplinary healthcare teams remotely monitor and treat patients using technologies, have been considered as a solution for increasing the effectiveness and efficiency of public healthcare [7]. The implementation of this innovative model, however, faces hurdles in the form of infrastructure and technology barriers, organizational challenges, and integration with traditional hospital networks [8]. Confidence in the ability of technology to deliver services at a distance and awareness of the limitations of traditional models of care are increasing. This, in turn, stimulates the process of digitisation of health systems worldwide. A policy analysis of an operational VH aids policymakers and health managers to design virtual care services in their local contexts. Given that models intended to be useful for policy making often lack evidence of actual use, this research based its analysis on a case study of a successful implementation of a VH, namely the Sydney Local Health District Virtual Hospital (Sydney Virtual) in Australia.

Barriers

Virtual hospitals (VHs) represent a transformative shift in healthcare delivery, promising greater accessibility, efficiency, and patient-centred care. This transformation, however, is not without its obstacles. Clinicians, administrators, and policymakers have consistently identified several key barriers that must be addressed to ensure the success and sustainability of virtual care models [9].

One of the most pressing challenges is staffing and workforce design. Virtual hospitals require multidisciplinary teams that mirror the collaborative structures of traditional inpatient settings. Yet, determining the optimal staffing ratios, such as the balance between nurses and doctors, remains unresolved. Clinicians working in VHs must also develop new competencies, including technical proficiency and adaptive communication skills. The lack of standardized training programs and recognition of virtual care expertise in career advancement further complicates workforce readiness. Without structured education and fair compensation for these specialized skills, the risk of burnout and inefficiency looms large [8].

Virtual hospitals risk exacerbating healthcare disparities, particularly for vulnerable populations such as Indigenous communities, non-English speakers, the elderly, and socio-economically disadvantaged groups. Language barriers, limited digital literacy, and accessibility issues (e.g., hearing impairments, and access to smart devices) can prevent these patients from fully benefiting from virtual care. Without targeted interventions, VHs may inadvertently widen the equity gap, leaving marginalized groups further behind [8].

The implementation of virtual hospitals and digital health systems relies on advanced technology and a robust, universally accessible IT infrastructure. These systems depend on the collection, digitization, and exchange of vast healthcare data, which must adhere to interoperable standards to ensure quality and seamless integration across providers. However, significant barriers persist, including limited data collection capacity, fragmented IT

infrastructure, and insufficient interoperability between devices and platforms. The absence of shared standards and integrated data repositories (e.g., cloud-based systems) further complicates data sharing, hindering AI-driven analytics and comparative health assessments [10].

Many people remain unaware of the data protection, privacy, and cybersecurity risks tied to how their personal information is managed and shared among digital services, particularly in today's digital and data-driven world. The issue is especially pronounced in healthcare, where personal data is frequently reused for research.

A regulatory framework is urgently needed to clarify data ownership, privacy, and ethical use, as healthcare data breaches remain a critical concern. The sector faces higher cybersecurity risks than other industries, with ransomware, phishing, and weak security protocols exposing sensitive patient information [11].

Finally, the evaluation and benchmarking of VHS are hindered by a lack of standardized metrics. Different VHS use diverse outcome measures, making it difficult to compare performance and identify best practices. A consistent evaluation framework is needed to ensure that VHS can scale effectively and deliver high-quality care [8].

An additional complication of virtual care (that occurs only in some circumstances) is the integration of hybrid care models, which blend virtual and in-person interactions. While hybrid care is widely seen as the most effective approach, there is no clear consensus on how to balance the two modalities. Escalation pathways, both within VHS and in coordination with external services like primary care and emergency response, are essential for patient safety. However, these pathways often lack standardization, leading to inconsistencies in care delivery. Strong partnerships with external providers are critical yet underdeveloped, leaving gaps in the continuum of care [8].

2. Study Design

The study design involved the review of relevant literature, a case study and semi-structured interviews (see Figure 1). The research method of the case study was based on the methodology prescribed in the sixth edition of *Case Study Research: Design and Methods* by Robert K. Yin [1]. The case study involved the review of relevant available documentation, qualitative semi-structured interviews, and the secondary data analysis of internal surveys. Literature about Sydney Virtual and available documentation were reviewed to familiarize with the Australian health care context, the background of Sydney Virtual, its strengths and its governance structure. The semi-structured interviews involved clinical and non-clinical staff, executive staff, and managers at Sydney Virtual. The framework utilised for the interviews has been developed by Kallio et al. [2]. The data analysis of the interviews consisted of a robust systematic thematic analysis based on the six-step framework developed by Naeem et al. [3].

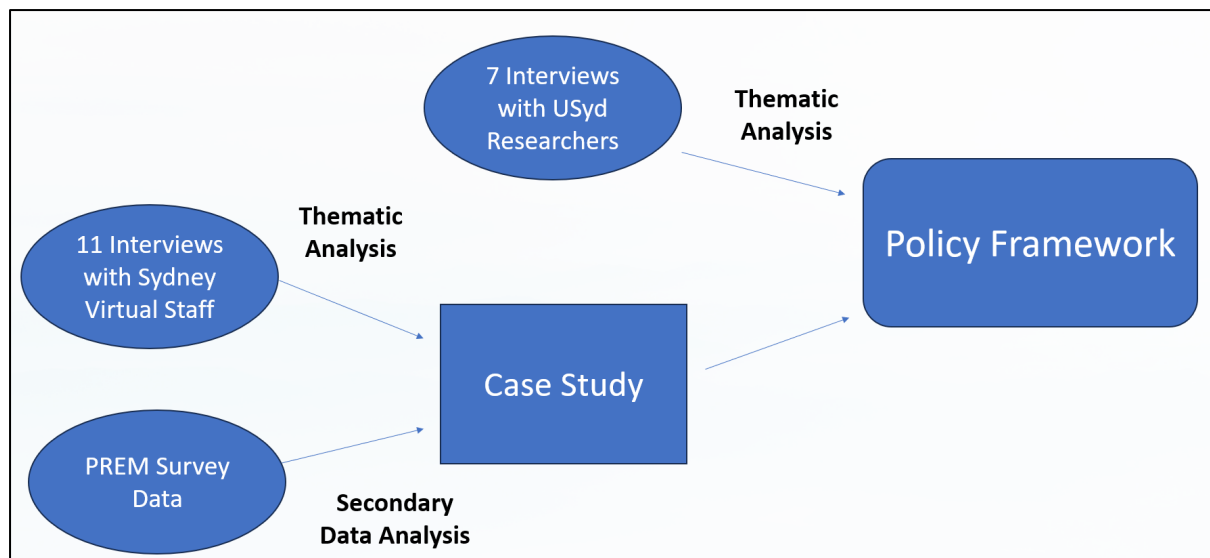


Fig.1 Diagram of the study design.

Ethics Review

Ethics approval for this research study (project identifier: 2025/ETH01363) was granted by the Sydney Local Health District Ethics Review Committee (RPAH Zone) on 11 July 2025. Site Specific Assessment (SSA) approval was granted by the Chief Executive Delegate at Royal Prince Alfred Hospital on 22 September 2025.

Qualitative semi-structured Interviews

Potential participants at Sydney Virtual were identified by the General Manager, who ensured they met the eligibility criteria by collecting their role information. Potential participants at the University of Sydney were identified by the Coordinating Principal Investigator.

The study established clear criteria to ensure the relevance and consistency of its participant pool. All participants were required to be adults, specifically individuals aged 18 years or older. The focus was on two main groups: researchers actively engaged in virtual care research at the University of Sydney, and IT experts, clinical staff, and managerial personnel currently employed at Sydney Virtual. This selection aimed to gather insights from professionals directly involved in the development, implementation, or analysis of virtual care initiatives.

Conversely, the exclusion criteria were designed to maintain the study's specificity and ethical standards. Individuals who did not provide informed consent were automatically excluded, as their participation would have compromised the ethical integrity of the research. Additionally, professionals or patients without affiliation to Sydney Virtual or the University of Sydney were not included. By adhering to these criteria, the study ensured that the data collected was both relevant and representative of the intended context.

Participants were given ten working days to consider participation. If no response was received, a reminder was sent, followed by a second reminder if necessary. No further reminders were sent after the second attempt. To prevent any real or perceived coercion, recruitment emails were sent on behalf of the researchers by the Sydney Virtual Executive Assistant, who had access to the mailing list. The Executive Assistant emailed potential participants the Participant Information Sheet and the Consent Form. The Participant

Information Sheet provided all necessary details for informed decision-making. Interested participants could contact the researchers and submit the signed Consent Form. A recruitment email was also sent to those identified at the University of Sydney by the administrative staff at the Leeder Centre for Health Policy, Economics and Data. No compensation was offered to participants.

After receiving the ethical approval and the Site Specific Assessment (SSA) approval, participants were recruited for semi-structured interviews. We interviewed 18 participants, surpassing the number that we estimated would allow us to reach thematic saturation (approximately 15 interviews). Every interview transcript was sent back to the interviewees for corrections. Transcripts were analysed with the help of NVivo.

Interviews were conducted via videoconferencing (Microsoft Teams) and lasted up to 60 minutes. They were video recorded using the embedded tools of Microsoft Teams, and transcriptions were generated using Microsoft Word. Data was stored in the University of Sydney's RDS (Research Data Store), separate from the Consent Forms. Transcripts were returned to participants for comment and/or correction, and field notes were taken during the interviews.

NVivo was used to manage the data. Coding was performed by one investigator. Quotations were not included in the results, as the small number of participants and their organizational roles could have made it easy to identify individuals. Transcripts were returned to participants for correction, and all findings were de-identified to ensure interviewees felt comfortable during data collection. While participants were not asked to provide feedback on the findings, they were offered the opportunity to receive a copy of the results.

The data analysis employed a systematic thematic analysis approach, using the six-step framework developed by Naeem et al. (2023). This process involved identifying and interpreting patterns within the dataset and included the following steps: transcript creation and data familiarization; keyword identification; code selection; theme development; conceptualization through interpretation of keywords, codes, and themes; and the development of a conceptual model (see Figure 2).

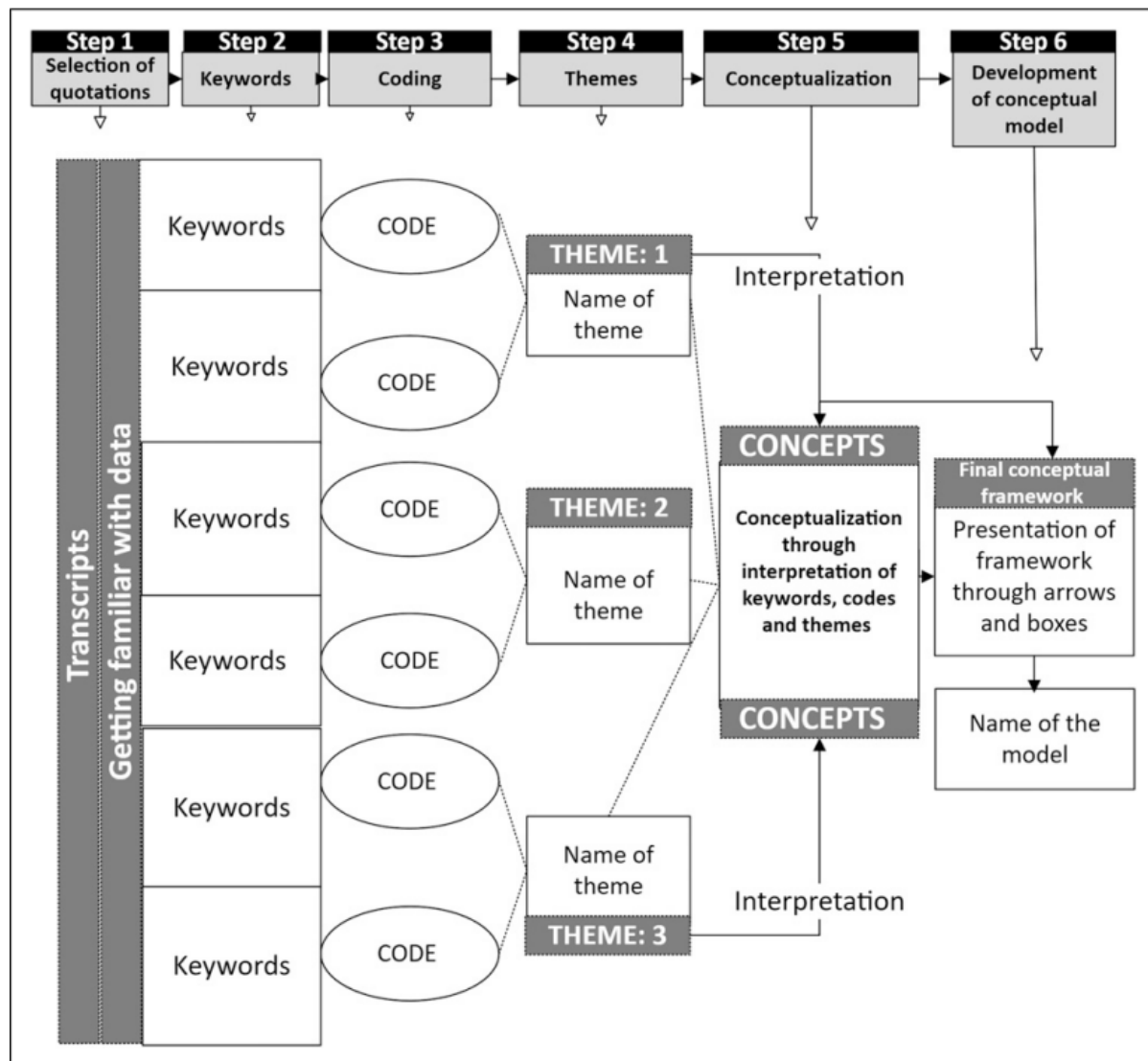


Figure 2. A systematic thematic analysis process (Naeem et al., 2023)

Quantitative Analysis

The secondary analysis of data involved Patient Reported Experience Measures (PREM) survey data collected at Sydney Virtual, to ensure that patient experiences were represented in the policy framework. The PREM survey is a structured, anonymous questionnaire designed to assess patient satisfaction and experience with virtual healthcare services. The survey collects feedback across several stages of the patient journey, including admission, during care, end of care, and overall experience. It evaluates aspects such as communication, respect, clarity of information, involvement in decision-making, and the perceived safety and effectiveness of virtual care. Questions are mostly multiple-choice, using Likert scales (e.g., "Strongly agree" to "Strongly disagree") to gauge responses. Unidentified data regarding the PREM survey was provided by Sydney Virtual after extraction from their database. The data is quarterly reported. The analysis was conducted on five questions considered relevant by the research team. See Appendix A for the list of variables used in the PREM data analysis.

3. Case Study

3.1. Overview of Sydney Virtual

In November 2019, the Sydney Local Health District (SLHD) decided to establish a virtual hospital to introduce a more sustainable solution to manage the increasing demand for healthcare and support patient flow in the district. A senior health administrator and medical specialist were tasked with developing a business plan and virtual hospital design. As there was no existing virtual hospital model in Australia, the implementation team contracted a research institute to gather information. The Sax Institute, an evidence specialist involved in health policy research, conducted a rapid literature review to provide information on the effectiveness of a virtual hospital mode and which conditions were safe and effective to be delivered using virtual care (primarily cardiac failure, diabetes and stroke rehabilitation) [12]. Consultation sessions were also held with all the district's senior medical leaders over a six-week period to gauge their perspective on the use of virtual care and willingness to collaborate with the new virtual hospital.

The SLHD provided initial funding to establish the infrastructure necessary to begin delivering virtual care. In January 2020, a team of healthcare managers and clinical leads led the implementation of the new virtual hospital.

In February 2020, the RPA Virtual Hospital (now known as Sydney Virtual) and its Virtual Care Centre were established. Sydney District Nursing (SDN), a long-standing community nursing service in the SLHD, was incorporated into Sydney Virtual and joined a small virtual care clinical workforce. On March 11 2020, Sydney Virtual began remote monitoring of patients positive to COVID-19 in the community and assumed a critical role in the state's response to returning travellers who were COVID-19 positive or at risk of developing COVID-19 [13]. The first few years of operation were focused on responding to COVID-19. As the relative importance of COVID-19 declined, Sydney Virtual focused on delivering other services. In 2022, the Respiratory Chronic Care Team joined Sydney Virtual. This Team had had been providing care in the community since 2001 [14].

At Sydney Virtual, a group of medical experts, including doctors, nurses, and allied health specialists, deliver care 24 hours a day, 7 days a week via pods equipped with videoconferencing equipment and remote patient monitoring capabilities [14]. The Sydney Virtual workforce includes in-person nursing and allied health services including hospital in the home, chronic and complex wound care, post-surgery care, respiratory chronic care, palliative and end of life care.

In 2025, Sydney Virtual is offering 18 clinical services, both in acute and chronic care (full list available in Appendix D). In 2025, an average of 13,600 patients received care in their homes, and there are more than 8,000 virtual care patients [15]. Sydney Virtual delivers healthcare primarily in patients' homes, but it also operates in ambulatory clinics, Emergency Departments, aged care homes, and NGOs supporting homelessness.

The service has extended to regional and rural areas such as Far West NSW, offering virtual midwifery and fracture care to reduce travel for rural residents. It supports new nurses in remote sites through the Virtual Nurse Assist program. Most Sydney Virtual referrals come

from Emergency Departments, hospital wards, Healthdirect Australia, NSW Ambulance Service, and General Practitioners.

Some examples of Sydney Virtual services are Virtual Urgent Care, Wound Care Command Centre, Emergency Department to Community, and Virtual Rehabilitation Service. The Virtual Urgent Care Service provides virtual clinical assessments, medical reviews, and patient care. Referrals come from hospital Emergency Department Virtual Hubs, Sydney District Nursing, homelessness NGOs, and General Practitioners. The virtualADULTS service, part of Virtual Urgent Care, partners with Healthdirect Australia and NSW Ambulance to create a Single Digital Front Door for urgent care. Sydney Virtual operates the virtualADULTS 'Metro Hub', serving metropolitan local health districts of Sydney, as well as some bordering regions (Illawarra-Shoalhaven and Central Coast regions). Notably, over 80% of patients receiving virtual urgent care consistently avoid Emergency Department visits.

The Wound Care Command Centre is a nurse-led service offering specialist wound care and advice to patients, clinicians, and GPs. Using a hybrid model (in-person and digital), it leverages AI-powered technology to assess wounds and guide treatment. The service ensures coordinated, shared care, improving healing outcomes and making wound management more efficient and accessible.

The Emergency Department to Community (ED2C) program supports frequent ED and ambulance users aged 16–70 with complex health and social needs. A multi-disciplinary team provides short-term case management, including medical, social, and psychological assessments, along with cross-agency care coordination. The goal is to create personalized ED management plans, reducing unnecessary hospital visits and connecting patients to community support. Referrals come from the NSW Patient Flow Portal and SLHD Emergency Departments.

The Virtual Rehabilitation Service helps adult patients recover at home sooner by offering short-term, intensive rehabilitation through a mix of in-person and virtual care. It includes virtual therapy sessions, expert medical reviews, and both individual and group programs tailored to different health needs. This approach ensures patients get the right support to regain independence quickly and conveniently.

Benefits

Whereas a physical hospital is constrained by the number of beds or the number of wards or the number of professionals that you can deploy in a specific service, a VH has fewer immediate physical constraints. A clear example of this benefit is the initial activity of Sydney Virtual's Virtual Care Centre, which handled COVID-19 outbreaks in Greater Sydney. From June 2021 until January 2022, Sydney Virtual provided care to more than 11,000 patients positive to COVID-19.

In July 2021, Sydney Virtual collaborated with NSW Health and NSW Ambulance to create a real-time "carousel" system, directing COVID-19 patients from Special Health Accommodation (quarantine accommodation) or the community to hospitals with available capacity. This approach balanced patient load across Greater Sydney, preventing overcrowding in strained facilities [16]. Between August and September 2021, only 20% of virtually assessed patients required emergency transport, dropping to 11% later. This suggests an 80-90% ED avoidance

rate, with an estimated 60-70% reduction after accounting for non-acute cases. The system optimized care, reduced unnecessary ED visits, and eased pressure on healthcare resources during a critical pandemic phase [16].

Sydney Virtual has demonstrated its potential to address patient and systemic challenges. Services like Virtual Rehabilitation and Virtual Trauma have reduced hospital stays, while others have provided outpatient services remotely [17]. Urgent and emergency care, too, is provided virtually, improving access, especially in rural areas. By September 2024, 38 post-surgery patients received virtual rehab outside of Greater Sydney, enhancing equity [17]. Multidisciplinary care has been shown to be easier in this setting, integrating medical reviews, therapies, and local coordination. Digital tools and AI enhance monitoring, optimizing treatment outcomes. By blending innovation with patient-centred care, Sydney Virtual improves accessibility, sustainability, and quality, bridging traditional and modern healthcare for better community well-being.

3.2. Findings

Thematic Analysis

Seven themes emerged from the thematic analysis of the Sydney Virtual interviews: regulatory framework; funding model; governance structure; support to patients; workforce upskilling and training; and IT and data management, research and evaluation.

Theme 1: Regulatory Framework

National Model Clinical Governance Framework

Sydney Virtual is required to have a Clinical Governance Framework in place, which is based on the Australian Commission on Safety and Quality's National Model Clinical Governance Framework [18]. This Framework defines clinical governance as a systemic approach integrating accountability, leadership, and culture within healthcare organizations to ensure safe, high-quality patient care. Rooted in the National Safety and Quality Health Service (NSQHS) Standards, it emphasizes corporate and clinical governance alignment, fostering transparency, continuous improvement, and patient engagement. The Framework underscores that effective governance requires collective responsibility across all organizational levels, from clinicians to governing bodies, while promoting patient-centred care through shared decision-making. By institutionalizing robust governance mechanisms, it aims to enhance clinical outcomes, mitigate risks, and strengthen public confidence in healthcare systems.

Accreditation

For Sydney Virtual, it has been critical to be fully accredited under the same national healthcare standards as any other publicly funded hospital service. The first full accreditation of Sydney Virtual was in April 2023, and the second one occurred in September 2025. Sydney

Virtual is accredited under the same national safety and quality standards as any other hospital facility, as there are no specific requirements for Virtual Hospitals. When Sydney Virtual underwent its first accreditation survey, the Australian Commission on Safety and Quality in Health Care sent an observer to improve its understanding of the applicability of its standards to a virtual hospital. The conclusion at the end of the first accreditation survey was that the assessors were able to apply all the usual criteria that they would apply to any traditional hospital.

Performance evaluation

Sydney Virtual is required to follow all Key Performance Indicators (KPIs) applicable to non-admitted services (community-based healthcare services that extend beyond or avoid hospital stays). As there is no set of virtual condition codes, patients at Sydney Virtual are classified as non-admitted patients. As many of the KPIs applicable to the inpatient setting are relatable to the VH setting, Sydney Virtual reports internally on unique patient numbers, demographics breakdown of patients, length of stay, even if they are not required for non-admitted services. In the case of virtual urgent care, they mimic KPIs applicable to physical Emergency Departments, to make a sound comparison with them.

Internal Policies

Some models of care apply to the whole Sydney Local Health District, like policies related to wound management. However, Sydney Virtual has also developed close to 150 internal policies regulating its governance. These include research, patient management, risk, antimicrobial stewardship (which regulates the use of antibiotics), patient 'no-show' and home-visiting. The wound service developed its own procedure guidelines for clinicians, which are relevant to the entire SLHD because it is a virtual model that incorporates AI applications to improve consistency and wound data collection. Sydney Virtual has developed a guideline to assist in the virtual diagnosis of patients with musculoskeletal problems or abdominal pain. The guideline outlines all the red flags and other relevant issues to consider when assessing patients in a virtual environment.

A key factor is how to manage clinical deterioration. It is crucial to escalate a patient's care in a timely manner in a VH setting. Sydney Virtual has risk assessments in place to ensure that patients and caregivers are safe at all times. If there is a concern about a patient's medical care, the pathways included in the policy outline how to escalate, and patients and caregivers are informed of these as well. These elements were not simply borrowed from inpatient care. Rather, they were adapted for virtual care. In addition the Virtual Care Centre is available to patients 24 hours, seven days a week and is a critical pathway for patients and carers to escalate concerns and deterioration.

Models of care

Each service at Sydney Virtual is associated with a specific model of care, not dissimilar to the way wards are organised in bricks-and-mortar hospitals. This is reflective of the different competencies of professionals in multidisciplinary teams, who most often work with a broad mix of conditions rather than a specific cohort of patients. The models developed guide the

safety and quality of health care. Sydney Virtual developed a guideline that dictates how to design and document all virtual models of care and the categories of information. When Sydney Virtual initiates a collaboration with a department in a different hospital, they develop and agree on a model of care containing eligibility criteria, governance arrangements, escalation pathways, and what care will be delivered virtually. This requires understanding that when the patient is referred to Sydney Virtual, the patient's clinical governance is assumed by the VH. The model of care outlines what access the referral department will have to the patient records and journey, and how information will be shared. These models of care are signed off on by all the relevant stakeholders and agreed to. They also include KPIs, the rationale, the evidence for introducing the model, and how evaluation will occur.

Theme 2: Funding Model

Funding Sources

Sydney Virtual was launched in February 2020 with internal funding provided by Sydney Local Health District. From March 2020, Sydney Virtual began remote monitoring of COVID-19 positive patients and managing all overseas travellers returning to New South Wales who were accommodated in health hotel quarantine. The first two years of operation were largely focused on responding to COVID-19, and special funds were released from the Commonwealth to support operations during this period. During this period however, Sydney Virtual continued to plan for a return to business as usual and submitted a funding application to the Commonwealth in 2021. From the financial year 2022/2023, Sydney Virtual was awarded a three-year Commonwealth and State of NSW funding grant as an 'Innovative Model of Care'. This funding was then extended for a further year in 2025/26.

Activity-Based Funding (ABF) is a healthcare funding system where hospitals are paid based on the number and complexity of patients treated. It is intended to promote efficiency, fairness, and timely access to care, with standardized payments across all hospital types. In Australia, ABF is the primary method for funding public hospitals under the National Health Reform Agreement (2011).

Given the range of models delivered by Sydney Virtual, some of which can be seen as direct replacements for existing services, flexibility is required in funding. For example, a service like Virtual Fracture Clinic can be seen as a replacement for an outpatient clinic appointment, which means that it could be funded using an existing Activity Based Funding (ABF) classification. Other services, however, don't neatly fit into an existing classification. For these services, it could be necessary to have a block funding arrangement. A new virtual care classification is expected to be released at the national level in the coming years. In the meantime, Sydney Virtual has identified new forms of funding. For example, the Virtual Urgent Care service is block-funded by NSW Health. That funding is part of an ED relief package funded by the NSW Government Treasury, and allocated to support capacity in EDs across Greater Sydney. The process of creating a mix of different funding sources requires collaboration with the NSW Ministry of Health and sharing of evaluation learnings with the Commonwealth government.

A reasonable approach could be to move a service to maintain a portion of block-funding for a certain period, giving time to collect costing data in the back end to build up the data to

drive the micro funding model for each specific service. After this initial phase, every model could move to an ABF funding model. In this way, it would be driven by the quantity of care delivered.

Costing

At this stage, it is still challenging to assess whether the cost represents the true long term cost of the virtual care services delivered, especially because of the volumes of patients and the level of maturity of the service delivery. When there is a bigger volume of patients constantly being remotely monitored and treated, there will be more economies of scale for the purchasing of technologies

Theme 3: Governance Structure

Standalone Entity

Sydney Virtual is a standalone hospital, and as such, it has been set up with the same governance arrangements that any hospital would have, albeit on a smaller scale. That means a full executive, a Clinical Council, a suite of policies, standalone accreditation under national standards, and a clinical governance manager. Having the opportunity from the beginning to be standalone allowed Sydney Virtual to create a better governance structure for innovative virtual care. It also generates confidence in the quality of care delivered by its clinicians, which is key to attracting referrals from other hospitals and health service professionals.

Link with the Sydney LHD

Although Sydney Virtual is a standalone facility, it is one of a number of hospitals under the governance of Sydney Local Health District and therefore aligns with governance requirements at the district and NSW Health level. For example, many of the internal committees described below are connected and report to SLHD-wide governance mechanisms.

Relationship with other Stakeholders

At Sydney Virtual, open communication is seen as an important enhancer of good quality and safe healthcare. Sydney Virtual is active in communicating the services it delivers and how these benefit both patients and the broader health system. This is achieved through oral and written communication including sharing of outcomes data and presenting case studies.

Events such as educational forums, clinical council meetings, and accreditation meetings foster collaboration with specialist departments in the SLHD. For Sydney Virtual, it remains important to establish and maintain good relationships with different hospitals and clinicians, in particular to support patient flow in the acute hospitals by encouraging referrals to virtual care.

For example, Sydney Virtual is seeking to involve specialists right from the design phase of the models of care, to get their input and understand their needs. This collaboration is undertaken

through communal forums, multidisciplinary teams and conversations with specialists. Likewise, Sydney Virtual seeks and responds to feedback from General Practitioners.

The NSW Ministry of Health has been supportive of Sydney Virtual activities and was instrumental in working with Sydney Virtual to develop the funding submission to the Commonwealth.

Leadership

Sydney Virtual's development was informed by professionals with substantial clinical governance expertise. The General Manager has the crucial role in leading the hospital. The position provides strategic and operational leadership of the clinical services, programs and people that comprise Sydney Virtual and ensures the development and provision of high-quality health care services that meet accreditation standards and are patient and family centred. The General Manager is responsible for setting the future direction of the facility in conjunction with the Clinical Director, other Facility Executive and District Executive. Strong leadership facilitates communication between the leadership team and frontline staff.

Internal Committees

Sydney Virtual's internal committees drive excellence across clinical, cultural, and digital domains. From ensuring clinical quality, patient safety and infection control to championing multicultural access and Aboriginal patient care, these groups shape policy, innovation, and research partnerships. Each committee fosters collaboration, data-driven improvements, and inclusive strategies to enhance service delivery and system effectiveness. Examples of internal committees at Sydney Virtual include:

- The Clinical Council, in which all clinical governance matters are discussed. Membership includes representation across the Executive Unit, all clinical disciplines and services. Policies, clinical documentation and privacy are discussed too, along with audits conducted over the year and their results, and ways to improve recommendations for services. Clinical incident reporting and consumer feedback reporting are discussed. Facility performance against KPIs and allocated budget are also standing agenda items.
- The Multicultural Access Committee, which monitors, discusses, and strategizes regarding access and experience of CALD patients. It includes a consumer representative and another service in the district called Diversity Hub, an expert service for working with CALD communities. This committee is used to discuss all incident data or complaints data collected from CALD communities. A CALD consumer is a member of the committee.
- The Aboriginal Health Working Group serves a similar purpose but in relation to service delivery to Aboriginal and/or Torres Strait Islander patients. The Working Group is co-chaired by the Deputy Director of Aboriginal Health in SLHD and includes Sydney Virtual Aboriginal Health Workers and a local Aboriginal Elder.
- Digital Health and Innovation and Sydney Virtual Working Group, which formulates ways to improve Sydney Virtual's information system. This is complemented by monthly meetings between the SLHD Chief Information Officer and the General Manager Sydney Virtual.

The Performance Unit

The Performance Unit at Sydney Virtual was established to address the unique demands of a virtual hospital, ensuring robust data management and tailored performance evaluation. At its core is the Director of Performance Reporting, a pivotal role responsible for overseeing Electronic Medical Records, maintaining accurate data classifications, and promoting high standards of data entry and quality. This position also focuses on designing customized reports to meet the specific needs of a virtual hospital, which often differ from traditional healthcare settings.

Unlike other services, Sydney Virtual operates its own "mini performance unit" due to the limited capacity of the district's central performance team, which primarily supports inpatient care. This independence allows Sydney Virtual to develop specialized reporting frameworks that align with its innovative service models and diverse funding sources. The Unit's autonomy ensures that performance data is not only collected but also analysed in ways that reflect the nuances of virtual care, enabling the hospital to evaluate its services effectively and adapt to evolving requirements.

Audits

Sydney Virtual undertakes an annual schedule of audits, which drive its quality improvement. An example is the discharge summary audit, which checks how many times a medication list was included. Some audits are like those carried out in traditional hospitals, whereas others reflect the differing requirements of virtual care. An example is the patient risk profile in venothromboembolism (blood clot) assessment, which is a bigger issue in a traditional hospital (where patients are less mobile) than in a VH.

Governance adaptation and flexibility

As Sydney Virtual evolves and matures, its governance structure has changed. When Sydney Virtual was created, a high-level Steering Committee was formed to supervise the implementation process. That was chaired by the Chief Executive, and included the Executive Director of Operations, one of the hospital's General Managers, senior medical leads, a representative from the Australian Commission on Quality and Safety in Healthcare, and a representative from the NSW Ministry of Health. The Steering Committee was critical to Sydney Virtual's success, providing high level guidance and oversight. The Steering Committee ran for three years, after which it was no longer deemed necessary as Sydney Virtual was embedded as a business-as-usual facility.

Similarly, a Clinical Advisory Council was created during Sydney Virtual's early implementation. This Council, which included clinical stream directors, provided suggestions for collaboration and new model of care design and contributed to the clinical governance of Sydney Virtual's activities. It was retired after two years.

As highlighted below, research and evaluation has been a cornerstone of Sydney Virtual from its establishment.

Theme 4: Support to Patients

Community trust is relevant for Sydney Virtual because the success of virtual care depends on patients and the public believing in its value. Even with well-designed and well-funded services, if the community don't understand how to use them or doubt their safety and quality, they won't engage. Trust ensures patients feel confident that virtual care delivers the same, or even better, results as traditional hospital visits. Addressing public perception is crucial, as the community needs assurance that virtual care isn't an inferior option. Without trust, the service risks being under utilised, no matter how effective it is.

Digital Patient Navigator

The Digital Patient Navigator at Sydney Virtual plays a key role in supporting patients with using the technology needed for virtual care. This includes guiding patients through the platform, explaining how virtual consultations work, and troubleshooting any technical issues they encounter. The navigator helps patients log on, understand the process, and feel comfortable using digital tools, much like a traditional patient navigator assists people in navigating a physical hospital. While the role is designed to ensure patients can access and use virtual services smoothly, the team also relies on nurses and allied health assistants for similar support, particularly after-hours. The navigator acts as a bridge, making virtual care more accessible and reducing barriers for those less familiar with technology. Their work is essential for ensuring patients can fully participate in their care without being held back by technical challenges.

Linguistically and Culturally Diverse Patients

Sydney Virtual implements several measures to mitigate barriers for linguistically and culturally diverse patients. They provide access to health care interpreter services, offering both video and telephone interpreting during consultations, despite the associated cost of providing this service. Patient information material is translated into eight to ten languages, ensuring materials are accessible and sent to patients in their preferred language.

Additionally, Sydney Virtual monitors patient experience data, specifically analyzing feedback from patients with English as a second language, to ensure they receive equitable care. Referrals include social and language background details to tailor support, and a Multicultural Access Committee oversees any issues related to interpreter use and cultural accessibility. These efforts help ensure that virtual care remains inclusive and effective for all patients.

Sydney District Nursing

The Sydney District Nursing (SDN) service plays a crucial role in Sydney Virtual by delivering critical sub-acute care in patients' home and also supporting hybrid models of care, which blend face-to-face and virtual care to meet clinical needs. While healthcare systems may prioritize efficiency metrics, such as increasing virtual consultations to reduce wait times, Sydney Virtual recognizes that not all patients can be effectively served through remote care alone. Some individuals may require in-person attention for accurate assessment, medication administration, wound care, etc. This patient-centred approach is vital in a system where standardized metrics might otherwise overshadow individual needs. Moreover, SDN's long-

standing reputation and experience help mitigate the challenges of disruption. Unlike newer models, it has proven its value over time, demonstrating that flexibility and in-home care are essential in delivering patient-centred care and supporting hospital avoidance.

Telemonitoring Devices

There is a team that delivers wearable devices for telemonitoring such as pulse oximeters, blood pressure cuffs and thermometers. If someone, for example, is going to be on the acute respiratory programme and they need the pulse oximeter, the team will deliver and collect the wearable devices from the patient's home, following a strict infection control process. Sydney Virtual also provides smart devices (like iPads and iPhones) to patients who don't have them, so that they can access the virtual hospital.

Theme 5: Workforce Upskilling and Training

Training

At Sydney Virtual, onboarding training begins with a broad organizational orientation, then focuses on service-specific and team integration. New staff, especially doctors, nurses and Allied Health professionals, receive structured training, mentoring, and a buddy system for hands-on support. Before managing patients, they complete skills assessments and competency checks to ensure readiness for virtual care. This process guarantees staff are confident, capable, and prepared to deliver high-quality care in a digital environment.

Workforce training is vital for skill growth, knowledge sharing, and honest reflection on what works. Sydney Virtual has developed and delivered workshops, conferences, as well as created patient stories. Patient stories humanize training, showing the real-world impacts of care. By presenting familiar cases, especially through filmed testimonials, staff can reflect upon tangible outcomes, reinforcing best practices and motivating improvement. Success stories and outcome measures build confidence and highlight the value of their work.

Through these training methods, staff improve care quality and adapt best practices, ensuring continuous professional development. Staff are adaptable to the different platforms used at Sydney Virtual thanks to the constant training and their good digital literacy. Having different communication options helps staff to adapt: telephones, emails, applications and videocall platforms are used to communicate with patients.

An example of training is the process followed by new employees to learn how to use the EMR platform. The EMR training process starts when a staff member logs a user access request ticket through the SARA platform. The team reviews the request, then organizes training, either face-to-face or virtually (using recorded videos). Training takes place in a simulated EMR environment, mirroring real functions like registration and documentation. After training, the staff member signs a checklist confirming their understanding. The completed paperwork is uploaded to the ticket and sent to Digital Health & Innovation for access setup. Once access is granted, the staff receive quick reference guides and manuals tailored to their role, along with help setting up their account. Additional resources are available on the intranet, and

refresher training is offered if needed, ensuring ongoing support as staff become comfortable using EMR in their daily work.

Multidisciplinary Teams

At Sydney Virtual, multidisciplinary teams collaborate to deliver safe, quality care, reduce hospital bed days and prevent readmissions. An example of a multidisciplinary team is the one managing the Virtual Rehabilitation service. Rehabilitation (medical) specialists and allied health professionals work together: acute hospital teams refer patients, who are assessed by rehab consultants before discharge. From day one at home, the team provides daily virtual rehab for 2–6 weeks, focusing on functional recovery, patient education, and community reintegration. The process starts with a doctor-to-doctor referral from hospitals like Royal Prince Alfred or Concord. After discharge, the team monitors progress, adjusts care plans, and either discharges patients who meet goals or transitions them to local outpatient or private services.

A multidisciplinary team at Sydney Virtual is co-located in the same care centre, which encourages constant communication and collaboration regarding patient care. The team uses digital platforms like Microsoft Teams for quick online updates, alongside formal documentation for record-keeping. Daily catch-ups include both formal case conferences, where patient goals, progress, and discharge plans are reviewed, and informal triage sessions to ensure patients are scheduled and handover is smooth. This setup allows for immediate problem-solving—if an issue arises during a virtual session, team members can quickly consult one another in person or via message, or have a doctor join the session right away to address questions or concerns. Being co-located and maintaining open communication helps the team respond faster, make decisions efficiently, and deliver well-coordinated, patient-focused care.

Relationship with the ICT Team

The relationship with the ICT team is a key driver at Sydney Virtual because technology is central to virtual care. Close collaboration between clinical operations and IT at both district and state levels ensures seamless digital health solutions, fosters innovation, and maintains reliable systems. This partnership enables efficient, high-quality virtual care and supports the unique tech-dependent roles in the service.

The Digital Lead position at Sydney Virtual acts as a dedicated bridge between clinicians and the DH&I team. This role focuses on understanding the operational and clinical needs of the frontline staff, while also leveraging their background knowledge to connect with the right teams within DH&I for support. Essentially, the Digital Lead works as a business partner, ensuring that technology aligns with clinical requirements and that Sydney Virtual receives the technical assistance it needs to operate smoothly.

Liaison profiles are relevant because they bridge the gap between clinical teams and technical or operational support. At Sydney Virtual, roles like the Digital Lead and Digital Patient Navigator ensure smooth communication, troubleshoot issues, and align technology with clinical needs. The Digital Lead translates clinician requirements into actionable IT solutions, while the Digital Patient Navigator resolves patient tech challenges. These profiles streamline workflows, reduce disruptions, and enhance care delivery by acting as direct points of contact,

fostering collaboration, and ensuring both staff and patients can effectively use virtual care tools. Their presence is key to maintaining efficiency and quality in a tech-driven environment.

Theme 6: IT and Data Management

Data protection

Researchers interested in using patients' data must go through strict ethics applications. At Sydney Virtual, data protection is ensured through the NSW Health Information Privacy Manual, which outlines how to process medical records, consent and privacy. At the district level, other policies govern records management and privacy: the “EMR documentation, patient ID and verification” policy, disposal authorities n. 17, and n. 21. N. 17 relates to patient client records and n. 21 relates to administrative records. It outlines all the information about how long hospitals need to retain records for and at what point it's appropriate to be able to dispose of them. There is a NSW Health platform where outcome measures are collected, but some of Sydney Virtual data are not shared with external platforms because of privacy reasons.

eHealth NSW and SLHD Digital Health & Innovation Services

eHealth NSW is the NSW Health in-house provider of ICT solutions, such as the EMR, to NSW local health districts. They are leading the design and implementation of a Single Digital Patient Record (SDPR) across all of NSW Health. They work in partnership with all the LHDs and their IT units, like the SLHD DH&I service. They also provide a governance role in relation to cybersecurity, digital systems procurement and management, etc.

SLHD DH&I supports Sydney Virtual with procurement. Sydney Virtual introduced the Digital Lead position to support the design process of platforms and services involving the DH&I competencies and to ensure the needs of the virtual hospital are well understood.

Technological Devices

Wearable devices are sent to patients for different aims: blood pressure, oxygen, temperature and other vital signs. After giving their consent, patients receive instructions about how to use the devices, followed by surveys and face-to-face support from a specific team. The task of the wearable devices team is to deliver, clean and collect the devices. An application called Miya Precision is used for managing observations/data from the wearable devices. An observation dashboard is available to Sydney Virtual clinicians, displaying real-time vital signs data alongside data from the EMR and with fields for clinical notes and appointment scheduling.

Electronic Medical Record (EMR)

Sydney Virtual has its own location tree within the EMR and its own entity, under which all its patients are classified. Despite that, there is no set of virtual condition codes, and at this time

patients are classified as non-admitted. Because of that, some functions in the EMR are not available, like electronic prescribing and electronic ordering of pathology.

When Sydney Virtual was established, the EMR was already in use by Sydney District Nursing, but the staff had to adapt it to the specific needs of a virtual hospital, like video conferencing platforms used to provide virtual care.

Sydney Virtual ensures interoperability between monitoring devices and the EMR by processes that automatically upload medical documentation to the EMR once it is completed. The intention is to integrate it with the SDPR using the FHIR standard. To reach this level of interoperability, Sydney Virtual chooses only applications that can integrate into the directional EMR system. So all the patient readings and all the survey response can fit into the EMR system.

New IT Roles

In 2017, the SLHD introduced the role of Chief Medical Information Officer (CMIO) to oversee the implementation of new technology and the safety of in-house solutions. The CMIO liaises with clinicians to understand clinical needs and to translate that into technical terms to the IT team. On the other side, it has to translate the limitations of the IT team to clinicians. Finally, the CMIO implements broader district policies as related to digital systems and contributes to the design of new policies and guidelines giving feedback based on practical implementation.

This position, as well as those of the digital lead, is critical to translate the needs of clinicians to the ICT team and the resource limitations of the ICT team to the clinicians.

Interoperability

The SLHD purchases devices that are compatible with the EMR, not only through hyperlinks but through real integration. By meeting the FHIR standard, some of the data will also integrate with the new statewide system developed for NSW, called the Single Digital Patient Record (SDPR). Other requirements for new platforms include the integration of patient surveys into the EMR and the possibility of configuring those surveys locally. Another relevant requirement is the interoperability between the remote devices and patients' phones. Clear standards help to avoid the purchase of devices that are incompatible and require excessive troubleshooting.

Sydney Virtual uses the Miya Precision platform to manage the remote clinical monitoring of patients. The platform was co-designed by the Sydney Virtual clinical team, SLHD DH&I and the external provider. It was initially developed to manage COVID-19 patients, but has evolved and adapted to new patient cohorts now cared for by Sydney Virtual. The main advantage of the platform is that clinicians now have a way to manage patient flow using the platform dashboard. Through Miya, patients' vital signs automatically flow to the dashboard. If any issues emerge, vital signs can alert the staff in real time. The staff can also assign nursing reviews to patients in the same dashboard. This platform was a key innovation at an early stage, and after tailoring and refining it, it is now stable and reliable.

Statewide Platforms

The current EMR allows Sydney Virtual clinicians to see all patient information from hospitals within the district. To see information managed by other hospitals outside the district, it is necessary to request it from that hospital. eHealth NSW, the organization that manage the information systems in all of New South Wales, is developing the Single Digital Patient Record (SDPR) to handle that issue. The SDPR is the statewide platform which will provide a secure, integrated view of patient care across NSW, connecting all local EMRs. Sydney Virtual will implement use of the SDPR and is advocating for access to functions within SDPR that are not traditionally available in the non-admitted setting. To connect the EMR to the SDPR, they will use HL7.

The SDPR will enhance the ability of Sydney Virtual to deliver care on a statewide level. A service that could benefit from that, for example, is the Virtual Urgent Care service, which operates across Greater Sydney and regional areas in NSW. The information accessible to clinicians is now limited, but the SDPR will allow clinicians to drill down into the medical history of a patient to see their background (allergies, reaction to drugs, etc.).

My Health Record is a federal platform that will gather records of different types of healthcare providers (like public hospitals, GPs, aged care facilities, etc.). Patients can consult their records on My Health Record.

Theme 7: Research and Evaluation Process

Research and evaluation at Sydney Virtual has been an integral part of the hospital from its inception in February 2020, reflecting a forward-thinking commitment to evidence-based virtual care. Unlike many healthcare initiatives where research is an afterthought, Sydney Virtual embedded research and evaluation into its core structure, driven by the vision of its leadership team. The goal was clear: to build robust evidence supporting the efficacy and value of virtual care, especially as the hospital initially operated as a proof of concept for delivering healthcare remotely.

Sydney Virtual has a research and evaluation framework. This framework guides Sydney Virtual's research by defining priorities and focusing efforts on key areas, such as health outcomes, service development, and economic evaluations. It aligns studies and evaluations with strategic goals, ensuring targeted investigations and impactful reporting. The framework also integrates broader district-level guidelines to enhance research coherence and effectiveness.

Research Office

The arrival of the COVID-19 pandemic in March 2020 unexpectedly accelerated the hospital's role. Sydney Virtual rapidly pivoted to support pandemic response efforts, using remote monitoring and wearable devices to manage the largest cohort of COVID-19 patients in the country. This shift positioned the hospital as a hub for COVID-19 research, attracting collaboration requests from research institutions nationwide.

The Research Office, which reports to Sydney Virtual's executive, became a catalyst for innovation. It has facilitated studies that advanced understanding of virtual care during the pandemic and beyond. Its work not only supports clinical operations but also reinforces Sydney Virtual's reputation as a leader in digital health research, bridging the gap between practice and evidence in a rapidly evolving healthcare landscape.

Research Steering Committee

To manage the interest generated by Sydney Virtual, a Research Steering Committee was established in May 2020, ensuring structured oversight of studies and partnerships.

The Research Steering Committee at Sydney Virtual plays a pivotal role in guiding and overseeing research and evaluation activities. The committee was initially chaired by the SLHD Chief Executive and then the SLHD Director of Research and includes senior leaders, university academics and other and key research collaborators.

This Committee provides strategic oversight, assesses research collaboration requests, and ensures alignment with district and organizational priorities. It supports clinicians and staff, many of whom have limited research experience, by fostering partnerships, building research capacity, and embedding evaluation into models of care. The committee's governance ensures that research is integrated from the outset, enabling data-driven service expansion and demonstrating the safety, quality, and impact of virtual care. Over time, its structure has evolved to adapt to operational needs, transitioning from high-level steering to practical working groups as the hospital matured.

Evaluation Methods

As Sydney Virtual matured, the emphasis of the evaluation has shifted to health economics, which is a key interest of external stakeholders. In a challenging fiscal environment like that of publicly provided health care, virtual care has to complement and help the health system manage both demand and equity. One element of this is reducing length of stay and freeing up capacity in the hospital system. Other priorities for these institutions are the patient experience and the quality of care, but they are very interested to see if Sydney Virtual is taking pressure off the health system. The patient experience at Sydney Virtual shows that benefits are delivered both to the system and the patients.

An evaluation process is also used to analyse the feasibility and design of new models of virtual care that are being piloted. An example was the evaluation process used to shape the establishment of the Virtual Rehabilitation Service. It began when the district executive identified concerns about prolonged lengths of stay for specific diagnoses compared to peer hospitals. To address this, a comprehensive, multi-step approach was undertaken. Extensive data analysis was conducted, comparing length-of-stay metrics across health facilities over three financial years. Patient journeys were mapped to assess potential bed-day savings if an alternative service existed. Live audits in acute and subacute wards, involving rehabilitation consultants, further estimated the impact of a proposed virtual care model. Evaluation of the model of care has continued over subsequent years, most recently with a health economics focus.

All incident data are analysed monthly. Sydney Virtual ensures that any adverse incidents of significant severity are managed, investigated, and reported in full compliance with regulatory requirements. Through this process, Sydney Virtual demonstrates a commitment to delivering safe care. The few adverse incidents encountered occurred during the management of COVID-19 patients. Even in these cases, Sydney Virtual met all necessary standards for investigation and reporting. Importantly, no adverse findings have been identified regarding the structure of the virtual hospital or the quality of care provided.

Patient Reported Experience Measures (PREM) and Patient Reported Outcome Measures (PROM) are regularly collected. PROMs are collected by clinicians while they are treating patients, while PREMs are collected on discharge and then summarised for a quarterly report about the patients' experience. Patient experience data has been important since the beginning for Sydney Virtual because it helps to demonstrate success and encourage confidence and referrals. Sydney Virtual now has a data set of over 6,000 virtual care PREMs.

To collect evidence about the clinical effectiveness and cost-effectiveness of new models of care, different types of evidence generation are used. These include both observational studies and prospective randomised controlled trials. RECITAL is an example of a randomised controlled trial that evaluated the fracture clinic service at Sydney Virtual [19]. The trial compared the virtual fracture clinic with in-person care for people with simple fractures. The Virtual Trauma Clinic is an example of an observation trial, whose aim was to investigate the feasibility of a Virtual Trauma Clinic for patients with minor to moderate trauma [20].

Research Funding

Many research studies at Sydney Virtual are investigator-initiated, led by clinicians or other members of the hospital staff. Some research projects are internal. In this case, they are funded by the Sydney LHD.

A relevant source of external funding for research grants is the National Health & Medical Research Council (NHMRC), which sometimes targets specific research themes. To apply for these grants, Sydney Virtual has partnered with the NSW Ministry of Health, the University of Sydney, other universities, and Sydney LHD research institutions such as the Institute for Musculoskeletal Health. For translational research, HCF grants are the main source of funding.

Research Partners

Sydney Virtual has developed different research partnerships since it was launched, and some of them are embedded within services. Evaluation partners were included from the beginning to analyse the introduction of this new model of care. The first evaluations focused on the management of COVID-19 patients and were critical to capturing what was required in terms of early governance, digital infrastructure, organisational structure, patient experience, safety and quality. Sydney Virtual fosters research collaboration through a dynamic, partnership-driven approach.

Initially, executives engage stakeholders, often via patient referrals or existing contacts, to explore service development. These interactions frequently spark interest in research and evaluation, as partners express enthusiasm for co-creating innovative solutions. By leveraging established networks and expanding to new contacts, Sydney Virtual builds robust

partnerships. Many collaborations begin with service development, then evolve into joint research or evaluation projects. Stakeholders, excited by the potential, often propose new focus areas or connect Sydney Virtual with additional partners. This cyclical process of engagement and co-development strengthens relationships, drives service expansion, and fuels impactful research initiatives. An enduring evaluation research partner is the Leeder Centre for Health Policy, Economics and Data (University of Sydney), co-authors of the main evaluation reports regarding the Sydney Virtual since commencement [15] [16].

Secondary Data Analysis

Unidentified data regarding the PREM survey were provided by Sydney Virtual after extraction from the REDCap database. The analysis was conducted on five questions from the PREM survey which the research team considered to be most relevant for the policy analysis, ensuring that patient experiences were represented in the research. Appendix A outlines the variables that were used in the analysis. We did not request a waiver of consent from the Sydney Local Health District Ethics Review Committee as we were not using data that were identifiable. No identifiable information, including study ID, was transferred.

OUTCOMES OF INTEREST

This data analysis was descriptive. Analysing responses to the interview questions was contingent on the nature of each variable. For binary variables, such as "I benefited from the virtual care appointment", outcomes were typically expressed as the percentage of participants who responded affirmatively, providing a clear measure of prevalence. Likert scale variables, like "Satisfaction with virtual care", allowed for the calculation of distribution percentages across response categories. Nominal (non-binary) variables were analysed by examining the frequency distribution of responses across categories. This approach provided insights into how participants were distributed among different categories, highlighting prevalent patterns and preferences within the dataset. Collectively, these outcomes contributed to an evaluation of virtual care experiences, informing targeted improvements and policy decisions. The five key outcomes were ratings of care quality as good or very good, patients benefiting from virtual appointments, most recognized benefits such as willingness to use virtual care again and alternatives to virtual care. Data were gathered and analysed from the 15th of October 2025 to the 30th of October 2025. Data reports were sent by Sydney Virtual to the Investigator Enrico Gallo and then analysed with the supervision of the Coordinating Principal Investigator.

RESULTS

The first outcome analysed was the portion of patients who rated the care received from Sydney Virtual as good or very good (ordinal). The distribution of the 5 possible ratings (from "very good" to "very poor") was summarized using frequencies, percentages, and cumulative percentages. A bar chart was created to visualize the portion of patients who rated the care received as good or very good (APPENDIX B, Chart 1). The chart shows that between January

2023 and June 2025, the portion of patients who rated the care received as good or very good has always been above 94%.

The second outcome was the portion of patients who benefited from virtual care appointments (nominal, binary variable). Frequencies and percentages were calculated for the two response categories (YES/NO). A bar chart was created to visualize the distribution (APPENDICES B, Chart 2). From January 2023 to December 2024, the portion of patients who benefited from virtual care appointments above 91%.

The third outcome was the benefit of virtual care most often recognised by patients. The PREM survey asked patients to indicate which benefits they received from a list of seven possible benefits (nominal, multiple categories). Frequencies and percentages were calculated for each of these. A line chart with multiple series was used to display the relative prevalence of each benefit (APPENDIX B, Chart 3). The relatively most recognised benefit was avoided travel, chosen by more than 70% of patients in all quarters, except in quarter January to March 2024. The second most recognised benefit was that virtual care helped patients understand and manage their condition. More than 60% of patients selected this benefit in all quarters except October to November 2023. This benefit could be partly linked to the possibility of inviting family members during treatment, a benefit chosen by around 13% of patients on average. The proportion of patients who stated that they benefited from the possibility of saving money was also significant (between 28% and 38%).

The fourth outcome analysed was the portion of patients who would use virtual care again (nominal, binary). Frequencies and percentages were calculated for the two response categories (YES/NO). A bar chart was created to illustrate the distribution, highlighting the most and least preferred choices (APPENDIX B, Chart 4). From January 2023 to June 2025, the percentage was always above 85%.

It is of interest to see what the alternatives to virtual care are, although Sydney Virtual did not include this question in the PREM survey until October 2024. Frequencies and percentages are presented for each of the five alternatives (nominal, multiple categories). A bar chart compares the proportions of responses across categories (APPENDIX B, Figure 5). Particularly relevant is that from January 2025 to June 2025, more than 10% of respondents declared that they would have not received any type of care if they could not access virtual care appointments. Another interesting finding was that most Sydney Virtual patients would have used other hospital services or visited a General Practitioner.

4. Discussion

Sydney Virtual serves as a base for solid policy analysis, thanks to the experience accumulated since its establishment in early 2020. Sydney Virtual operates in a regulatory framework designed for traditional hospitals due to the lack of specific regulation concerning virtual hospitals in the Australian regulatory landscape. However, thanks to the applicability and adaptability of many requirements and standards to the virtual setting, that does not seem to be a real barrier for the implementation of a functioning virtual hospital. When specific instructions are needed, internal policies can provide more tailored indications.

Sydney Virtual shows that an innovative service can benefit from flexible funding, especially during the inception phase. Despite the relevance of a certain degree of funding stability, Sydney Virtual managed to create a mix of different funding sources through its first years of functioning, enabling its adaptability in a changing context like that of the COVID-19 pandemic. As far as pricing, it is important to continue to collect data while a service is evolving and as it matures and stabilises.

The standalone governance structure of Sydney Virtual is a key enabler for the effectiveness of its services. Having strong leadership, a full executive and a suite of policies, Sydney Virtual's professionals can count on supportive management. That is a crucial aspect when it comes to collaborating with other hospitals, because it gives the confidence and authority needed to attract referrals. The effectiveness of this governance structure also relies on the internal committees, which make information flow smoothly between different levels and sectors.

Sydney Virtual could not be effective if it did not gain trust from the community and patients. The support for patients is at the core of Sydney Virtual's effectiveness and appreciation. This support consists of different measures introduced to make the patient experience as smooth as possible. Thanks to these measures, like the Digital Patient Navigator and hybrid models that include community nursing, Sydney Virtual can mitigate common barriers to the use of virtual care, like digital illiteracy and lack of trust in digital healthcare.

Sydney Virtual benefits from co-located multidisciplinary teams, which foster collaboration and communication. Thanks to this arrangement, coordination in virtual care delivery is more seamless and problem-solving more immediate. The establishment of the role of Digital Lead allowed Sydney Virtual to avoid major issues caused by a lack of communication between the ICT team and clinicians.

The EMR was key for the success of Sydney Virtual, as it enabled to store and manage comprehensive patient clinical data. However, a key tool for Sydney Virtual was the Miya Precision dashboard created to integrate telemonitoring platforms with the EMR, enabling clinicians to replace fragmented digital records. This integration was possible thanks to the selection of applications that can address the interoperability needs of the hospital. (for example, by meeting the FHIR standards). To enhance interoperability with hospitals outside the SLHD, NSW is developing the Single Digital Patient Record. The goal is to provide secure, integrated view of patient care across the State, and not just within the district. A national initiative, called My Health Record, gathers patient records from different types of healthcare providers with information accessible to patients.

The secondary data analysis of the PREM survey emerges that the rate of satisfaction is high among respondents. Although this shows positive feedback from patients, it is important to take into account that the results could be affected by a self-selection bias. To assess the service delivered by a Virtual Hospital, it is important to use different evaluation methods. A hospital can't be evaluated with only one metric because the variables involved are numerous and, in some cases, very technical. Hence, it is important to look at many evaluation measures and tools at the same time to have a comprehensive overview of the benefits of Virtual Hospitals.

Conclusions

The interconnected, dynamic nature of the seven key components is essential to the functioning and evolution of Sydney Virtual. These components are mutually reinforcing and interdependent, rather than existing in isolation. These components are not static or independent. Instead, they continuously interact and reinforce each other: Changes in one area ripple through the system. For example, a new regulatory requirement might necessitate updates to technology, which in turn affects workforce training and patient support. Feedback loops are critical. Research and evaluation provide data that inform governance and funding decisions, which then shape the workforce and technology and inform the introduction of virtual hospitals elsewhere. Flexibility and integration are essential. The system must adapt to internal and external changes, ensuring that all components evolve together rather than in silos. In conclusion, Sydney Virtual's ability to navigate challenges and changes over time is rooted in how these seven aspects work together. Presenting this case study to policy makers emphasizes that holistic, integrated approaches, rather than isolated interventions, are key to sustained success. The power of this case study lies in its emphasis on interconnectedness. It's not just about having strong funding, governance, or technology, it's about how these elements interact, adapt, and reinforce each other to create a resilient and responsive system.

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Appendices

APPENDIX A – Variables used in the PREM data analysis

Variable Name	Variable Description	Variable Type
I benefited from virtual care appointments	The answer can be YES or NO	Nominal (binary)
The benefits I received were	The are 7 possible answers listed: save travel, save money, did not miss work/school, include family, not need to arrange for others, helped understand, other benefits	Nominal
Overall, I would rate the care I received as	5 possible rates, from “very good” to “very poor”	Ordinal
If I didn’t use virtual care, I would have...	5 alternatives to virtual care	Nominal
If given the choice, I would use virtual care again	4 possible answers: “yes, definitely”, “yes, in some circumstances”, “no”, “don’t know”	Nominal
Year of response	Year of response	Continuous

APPENDICES B – Secondary Data Analysis

Table 2 – Portion of patients who rated the care received as good or very good

	Q3 JAN- MAR 2023	Q4 APR- JUN 2023	Q1 JUL- SEP 2023	Q2 OCT- DEC 2023	Q3 JAN- MAR 2024	Q4 APR- JUN 2024	Q1 JUL- SEP 2024	Q2 OCT- DEC 2024	Q3 JAN- MAR 2025	Q4 APR- JUN 2025
PORTION OF PATIENTS WHO RATED THE CARE RECEIVED AS GOOD OR VERY GOOD.	97.40	98.00	97.80	99.50	96.20	96.30	98.10	94.10	94.60	96.80

Chart 1 – Portion of patients who rated the care received as good or very good

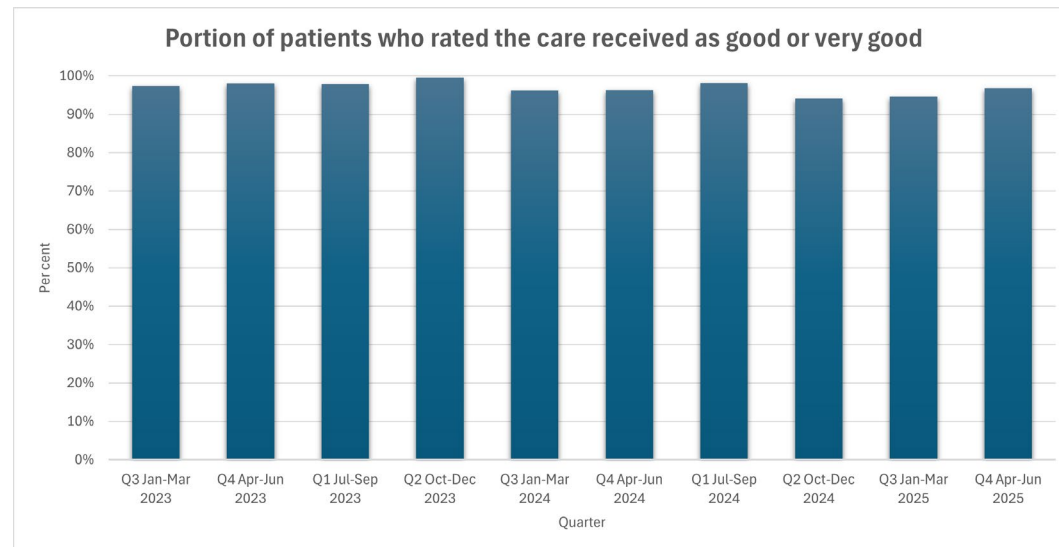


Table 2 - Portion of patients who benefited from virtual care appointments

Policy Analysis Sydney Virtual: Final Report

		Q3 JAN- MAR 2023	Q4 APR- JUN 2023	Q1 JUL- SEP 2023	Q2 OCT- DEC 2023	Q3 JAN- MAR 2024	Q4 APR- JUN 2024	Q1 JUL- SEP 2024	Q2 OCT- DEC 2024
PORTION OF PATIENTS BENEFITED FROM VIRTUAL CARE APPOINTMENTS	OF WHO FROM CARE	98.2%	95.7%	94%	94.6%	95.5%	91.8%	94.9%	95.1%

Chart 3 - Portion of patients who benefited from virtual care appointments

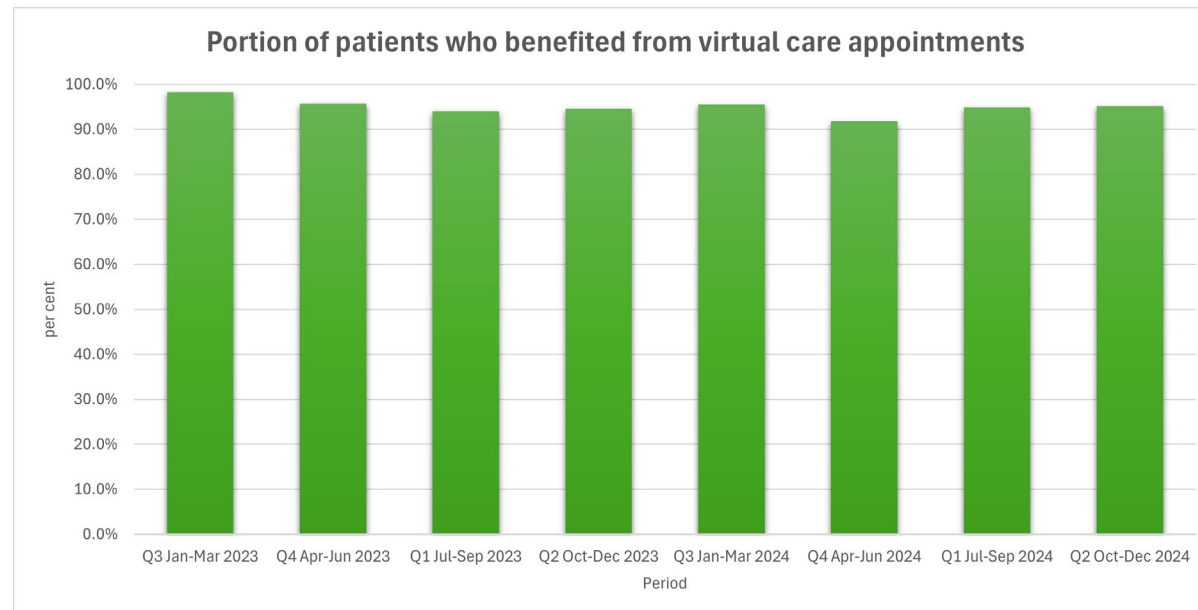


Table 2 - Benefits received by patients

	Q3 JAN- MAR 2023	Q4 APR- JUN 2023	Q1 JUL- SEP 2023	Q2 OCT- DEC 2023	Q3 JAN- MAR 2024	Q4 APR- JUN 2024	Q1 JUL- SEP 2024	Q2 OCT- DEC 2024
I WAS ABLE TO REDUCE MY NEED TO TRAVEL	83%	88%	75%	71%	67%	81%	83%	88%
I SAVED MONEY	37%	30%	34%	38%	28%	32%	36%	35%
I DID NOT MISS OUT ON WORK OR SCHOOL	44%	23%	15%	15%	9%	15%	20%	24%
I COULD INVITE MY FAMILY	2%	11%	19%	18%	21%	13%	10%	9%
I DID NOT NEED TO ARRANGE CARE FOR MY CHILD AND/OR DEPENDENT/S	11%	6%	7%	9%	7%	6%	11%	5%
IT HELPED ME UNDERSTAND AND MANAGE MY CONDITION	62%	72%	62%	54%	64%	65%	68%	62%
IT BENEFITED ME IN OTHER WAYS	13%	16%	18%	26%	30%	26%	20%	15%

Chart 3 - Benefits received by patients (multiple options)

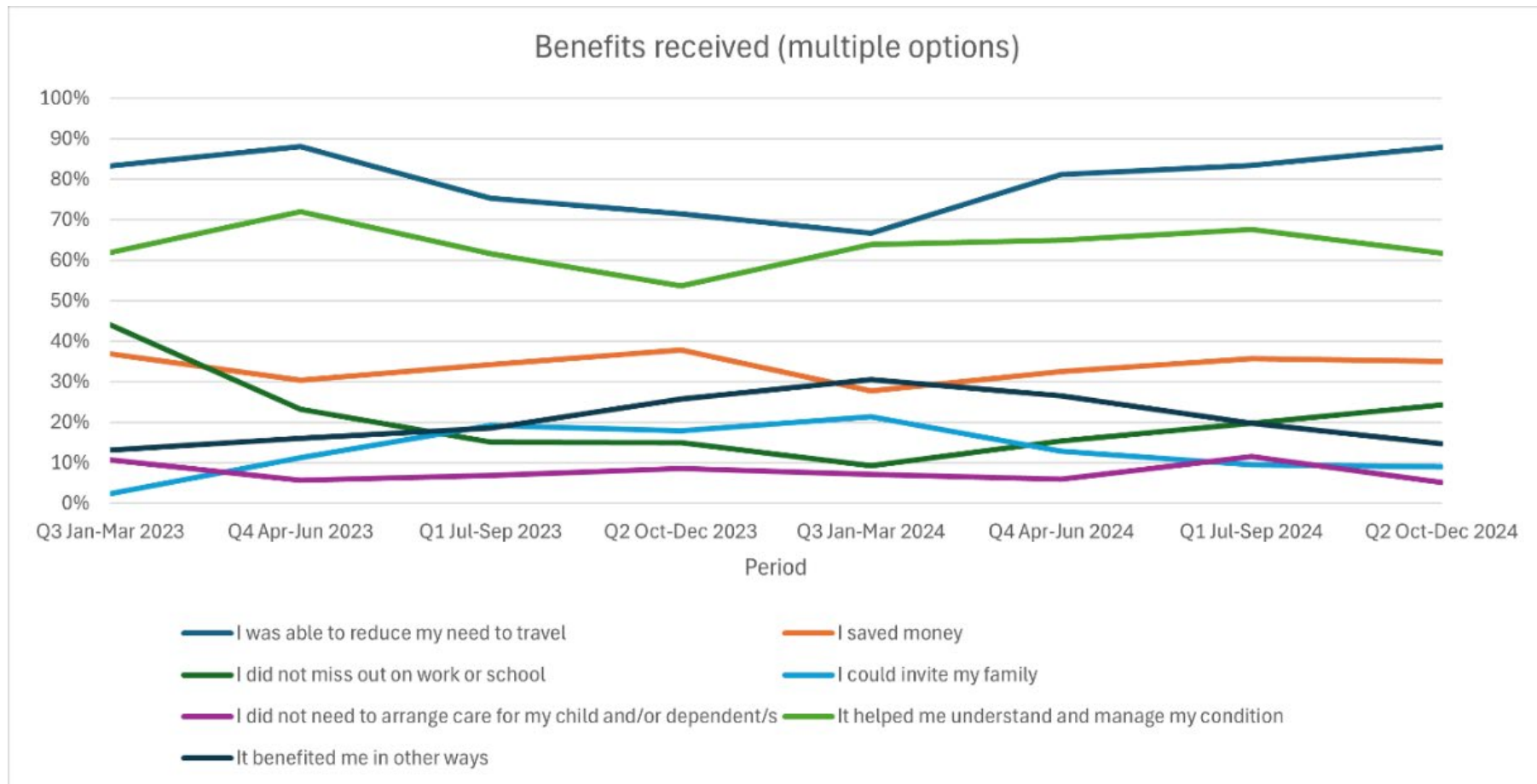


Table 5 – Portion of patients who would use virtual care again

Policy Analysis Sydney Virtual: Final Report

IF GIVEN THE CHOICE, I WOULD USE VIRTUAL CARE AGAIN	Q3 JAN-MAR 2023	Q4 APR-JUN 2023	Q1 JUL-SEP 2023	Q2 OCT-DEC 2023	Q3 JAN-MAR 2024	Q4 APR-JUN 2024	Q1 JUL-SEP 2024	Q2 OCT-DEC 2024	Q3 JAN-MAR 2025	Q4 APR-JUN 2025
YES	92%	92%	87%	92%	90%	86%	92%	85%	94%	96%

Chart 4 – Portion of patients who would use virtual care again

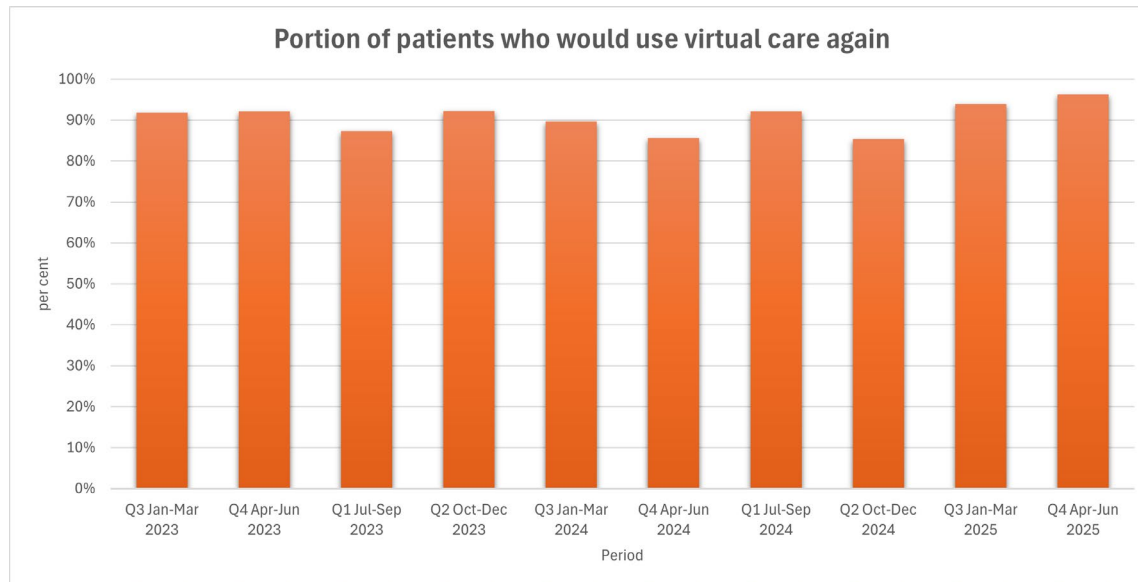
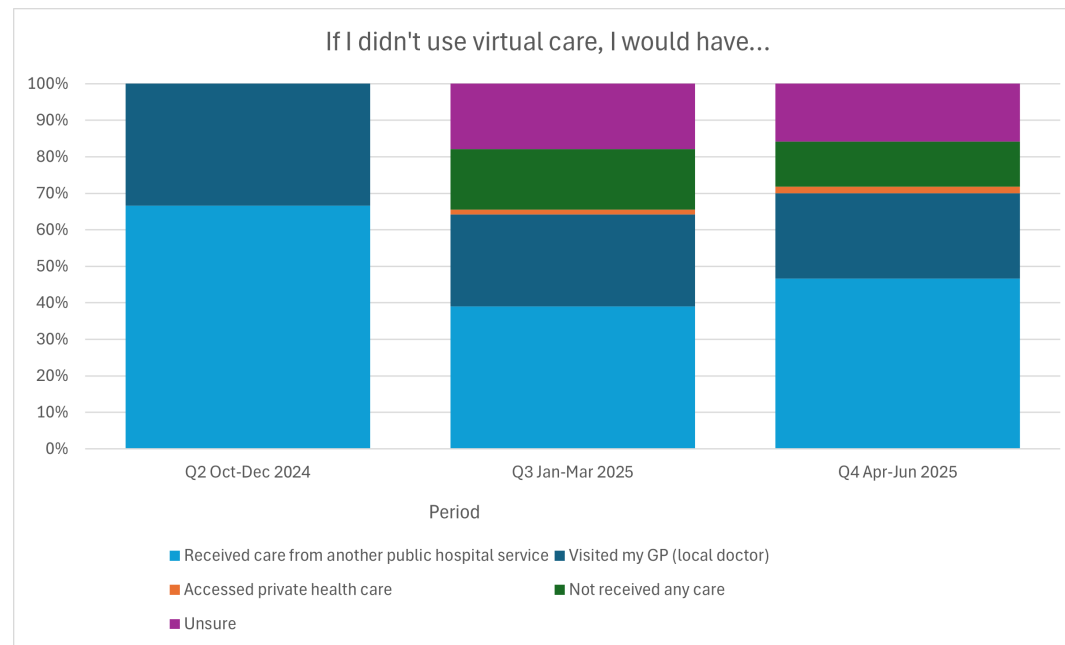


Table 6 – Alternatives to virtual care

IF I DIDN'T USE VIRTUAL CARE, I WOULD HAVE....	Q2 2024	OCT-DEC 2025	Q3 2025	JAN-MAR	Q4 APR-JUN 2025
RECEIVED CARE FROM ANOTHER PUBLIC HOSPITAL SERVICE		66.7		39.0	46.6
VISITED MY GP (LOCAL DOCTOR)		33.3		25.2	23.4
ACCESSED PRIVATE HEALTH CARE		0.0		1.4	1.8
NOT RECEIVED ANY CARE		0.0		16.6	12.3
UNSURE		0.0		17.9	15.9

Chart 5 – Alternatives to virtual care



APPENDICES C – Keywords Thematic Analysis

Table 7 – Keywords

Keywords Theme 1: Regulatory Framework

clinical governance framework
managing the deteriorating patient
diagnosis of conditions
antimicrobial stewardship
adapted
pathways set up
hybrid model of care
procedure for clinicians
same policies
usual criteria
KPI performance evaluation
models of care
RPAV policies
SLHD policies
coding

Keywords Theme 2: Funding Model

risk
political
philanthropic funds
COVID funding
innovation funding
funding flexibility
flexible funding
ABF funding

Keywords Theme 3: Governance Structure

referral pathways

communication

Strong Governance

clinical council

high level steering committee

multicultural access committee

research steering committee

evaluation committee

clinical quality council

Committees

professional relationship

build relationship

DH&I

district performance unit

link to established governance

standalone

performance unit

research office

Keywords Theme 4: Research and Evaluation

randomised controlled trial

cost effectiveness evaluation

Estimated Bed Day Saved

incident data

PREMs and PROMs

clinical incidents

evaluation of services

no coding district research

research

research strategic plan

investigated initiated

funding positions

grant

Commonwealth research funding

project manager on digital policy

clinicians involvement

evaluation partners

research and evaluation framework

research steering committee

Keywords Theme 5: Workforce

formal in services

developed brochure

conferences

patients story

vReHab

orientation process

IT team

liaison

tech-literate staff

different options

co-located

educational support

leaflet

training process

EMR training

Keywords Theme 6: Support to Patients

support from their end

people's trust

loan iPads

digital patient navigator

translators

aboriginal

socioeconomic
supply medication
patient mapping process
information sheets translated
loan iPads
DPN
translators
digital patient navigator
information packs patients
wearables team
not always appropriate
multicultural access committee

Keywords Theme 7: IT and Data Management

consent
good planning
wearable
cybersecurity procedures
paper records
data protection framework
Description Services
EMRs codes
MVD setting
automatically uploads to EMR
meetings with ICT person
remote monitoring dashboard
interoperability standards
digital lead
Liaison
research
my health record
single digital patient record
e health

wearable

accommodate existing software

APPENDIX D – List of Sydney Virtual Services

Virtual Care Centre

- **Virtual Urgent Care;** The Virtual Urgent Care Service facilitates virtual clinical assessment, medical review and care for patients. Referrals in Sydney Local Health District are received from Virtual Hubs in hospital Emergency Departments, Sydney District Nursing, targeted homelessness non-government organisations and General Practitioners.

VirtualADULTS is a service within the Virtual Urgent Care Service and partners with Healthdirect Australia and NSW Ambulance to implement a Single (digital) Front Door for urgent care. Sydney Virtual delivers the virtualADULTS ‘Metro Hub’, servicing all metropolitan local health districts, the Illawarra-Shoalhaven and Central Coast.

- **Acute Respiratory Infections;** The Acute Respiratory Infections clinic provides remote monitoring, assessment and review for an acute respiratory infection, including COVID-19.
- **Acute Diverticulitis;** This service provides virtual care and support for patients with acute diverticulitis at home. Remote monitoring devices support review of vital signs. This service was delivered as part of a small clinical trial in 2023/24. The results of the trial have informed the introduction of the service ongoing.
- **Virtual Rehabilitation Service;** The Virtual Rehabilitation Service supports earlier discharge home for adult patients who require short-term intensive rehabilitation. The service provides early and intensive multi-disciplinary therapies.
- **Virtual Trauma Clinic;** The Virtual Trauma Clinic is a multi-disciplinary follow-up clinic for trauma patients with injuries such as rib fracture, concussion syndrome and limb injuries.
- **Virtual Fracture and Low Back Pain Clinics;** The Virtual Fracture Clinic is a physiotherapy-led service that manages patients with clinically and radiologically diagnosed simple fractures. Referrals are from General Practitioners, from Sydney Local Health District Emergency Departments and Orthopaedic Outpatient Clinics.
- **The Low Back Pain Program,** known as Back@Home, is a hybrid model of care that supports patients with acute, non-serious (ie – non-specific and radicular) low back pain at home to avoid an unnecessary hospital admission.
- **Wound Care Command Centre;** The Wound Care Command Centre is a nurse-led service that provides specialist wound care and advice to clinicians, patients and their

treating General Practitioner. Care is augmented by a digital wound application with artificial intelligence.

- **Emergency Department to Community;** The Emergency Department to Community program is an intervention for patients 16 to 70 years who are frequent users of the Emergency Department and/ or NSW Ambulance and who have complex health and social needs. A multi-disciplinary team provides short team case management and care coordination. Referrals are from the NSW Patient Flow Portal and SLHD Emergency Departments.
- **‘Yudi’ Aboriginal Chronic Disease Care Coordination;** The Yudi Aboriginal Chronic Disease Care Coordination service is for Aboriginal people with chronic conditions who have been discharged from an inpatient stay in a Sydney LHD hospital. 49% of patients reside in SLHD, an overall 60% reside in metropolitan Sydney and the remainder from regional and rural LHDs.
- **Long COVID Program;** The Long COVID Program accepts patients with enduring COVID-19 symptoms that have not been resolved in primary care. The clinic includes assessment and review, liaison with the patient’s General Practitioner, recommendations for management, and an eight-week allied health self-management support program.
- **Eating Disorders;** The Virtual Eating Disorders Connect (vE-Connect) service is a single point of contact for clinicians and other providers caring for people with eating disorders. vE-Connect provides support for service navigation and is available to clinicians caring for patients 16 years or older with a suspected or diagnosed eating disorder. Referrals are accepted from General Practitioners, Emergency Departments, Community Mental Health Services, inpatient teams and community-based healthcare professionals.

In-Home Community Nursing and Allied Health

- Sydney District Nursing
- Hospital in The Home
- Wound Care/Chronic and Complex Care
- Palliative Care
- Respiratory Chronic Care
- Specialist HIV Nursing